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OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

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MEMORANDUM

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SUBJECT: Clothianidin Non-pollinator Addendum and Chemical-specific Response to Comments Document for Public Comments Received on the Registration Review Preliminary Pollinator and Preliminary Non-pollinator Risk Assessments

FROM: Michael Wagman, Biologist
Chuck Peck, Senior Fate Scientist
Environmental Risk Branch 6
Environmental Fate and Effects Division (7507P)

THRU: Mark Corbin, Branch Chief
Monica Wait, RAPL
Environmental Risk Branch 6
Environmental Fate and Effects Division (7507P)

TO: Matthew Khan, Chemical Review Manager
Marianne Mannix, Acting Team Leader
Ricardo Jones, Team Leader
Dana Friedman, Branch Chief
Risk Management and Implementation Branch 1
Pesticide Re-evaluation Division (7508P)

The Registration Review process for the neonicotinoid (e.g. neonic) insecticide clothianidin has been a phased process with release of pollinator and non-pollinator preliminary risk assessments at different times with individual public comment periods. Additionally, the registration review of clothianidin has been closely aligned, in timing and risk assessment methodology, with the three other nitroguanidine-substituted neonicotinoids imidacloprid, thiamethoxam, and dinotefuran. **Appendix 1** provides a summary table of the risk assessment documents and docket numbers associated with each of the four neonics.

This purpose of this document is to respond to clothianidin-specific public comments received on the preliminary pollinator assessment and preliminary non-pollinator assessment. Also, this document serves as an addendum to the preliminary non-pollinator risk assessment, where additional modeling or

risk quotient corrections were needed, or where additional characterization or impacts to risk conclusions are discussed.

Updates and responses to clothianidin-specific comments on the preliminary pollinator risk assessment have been incorporated into the *"Final Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam"*.

For responses to public comments that were common across all four neonicotinoid active ingredients for the preliminary pollinator and non-pollinator risk assessments, a common response to comments document was written. See the document, *"EFED Response to Public Comments Common to the Preliminary Pollinator and Preliminary Non-Pollinator Registration Review Risk Assessments Across the Four Neonicotinoid Pesticides (Imidacloprid, Thiamethoxam, Clothianidin, and Dinotefuran)"*.

For chemical-specific response to comments for imidacloprid, thiamethoxam, or dinotefuran, please see their chemical-specific RTC documents in their individual registration review dockets.

This document is divided into several sections. **Section 1** responds to clothianidin-specific public comments on the preliminary pollinator risk assessment. **Section 2** responds to clothianidin-specific public comments on the preliminary non-pollinator risk assessment, and **Section 3** is an addendum for addressing any updated modeling or risk conclusion discussions for non-pollinator taxa.

EFED generally uses an outline format to address public comments (comment followed by EFED response). Full text of the public comment submissions can be found in the clothianidin docket at [HYPERLINK "http://www.regulations.gov"] (EPA-HQ-OPP-2011-0865).

Section 1. EFED Response to Comments for Clothianidin-Specific Preliminary Pollinator Risk Assessment Public Comments

This section responds to clothianidin-specific public comments that were received on the *"Preliminary Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam"* (DP 437097; 1/5/2017; Docket ID: EPA-HQ-OPP-2011-0865-0173).

Valent USA; EPA-HQ-OPP-2011-0865-0197

1) The registrant provided updates of label changes to the V10170 2.13 SC label (EPA registration no. 59639-150) including removal of some uses and edits to application rates and application intervals

   EFED Response: EPA appreciates the registrant's edits. The final bee risk assessment will consider all registered labeled uses for clothianidin, including but not limited to the cited 59639-150 product label. The Biological and Economic Analysis Division (BEAD) examined application rates and provided a summary spreadsheet label data report to EFED on April 21, 2016. In general, EFED used this spreadsheet to determine the maximum registered labeled use patterns that are evaluated in the final risk assessment. In some cases, product labels may have been updated since the issuance of the BEAD label data report and prior to conduct of the final risk assessment. In those cases, the final risk assessment may not have captured all of the most recent changes to registered use site application rates. However, the risk assessment captures all registered use sites and corresponding use patterns, and risks across all use sites are well characterized so that for any potential differences in registered application rates, any associated changes in the degree of risk, and certainty in the risk call, can be inferred.

Bayer Crop Science and Valent USA; EPA-HQ-OPP-2011-0865-0201

1) The registrants note concerns regarding the Tier II endpoint used in the pollinator risk assessment. "Of particular significance is the endpoint identified by the EPA from the registrant-submitted colony feeding study i.e. an NOAEL of 19 ng/g diet. However, the next highest test level (35.6 ng/g) produced only transient effects with full recovery, and no long-term effects on honey bee colonies including colony survival. The lowest test level producing long-term effects was 71.8 ng/g. The Agency's assessment should therefore acknowledge that no long term effects on honey bee colonies, including colony survival, are expected for dietary exposures up to 35.6 ng/g, or one level higher than indicated in the current assessment."

   EFED Response: As identified in the data evaluation record (DER) for the registrant-submitted colony feeding study (MRID 49836101), significant effects occurred for multiple response variables including number of adults, pupae, total brood and total live bees endpoints, as well as the food storage endpoint of pollen storage. These effects occurred across multiple colony condition assessments (CCAs) indicating persistent effects. EPA's conclusions regarding the study also agree with the study author's conclusion that the lowest observable adverse effect level (LOAEL) was at the 40 ng/g nominal concentration (35.6 ng/g mean measured). EPA will continue to use the 19 and 35.6 ng/g endpoints as the NOEC and LOEC for this study in the final risk assessment and consider exposures relative to both endpoints. EPA notes that the additional colony feeding study (MRID 50312501) submitted by the registrants to address the

lack of overwintering success described in the first study, is also considered in the final risk assessment.

2) The registrants note concerns over the use of worst-case maximum residues and single site data and cite specific examples such as potato, cucurbits, cotton, corn, canola and oranges. The registrants suggest using more information to reach residue distributions and use upper bound estimates, rather than maximum worst-case values to evaluate potential risks

EFED Response: Between the preliminary bee risk assessment and the final risk assessment, a large number of new residue studies were submitted by all registrants of the four nitroguanidine-substituted neonicotinoids (clothianidin, dinotefuran, imidacloprid, thiamethoxam) which allowed for a much more robust database of empirical residues than were available at the time of the preliminary risk assessment. In the final risk assessment, EPA uses residue distributions where data allow (*e.g.* foliar uses on cotton) to generate median and upper bound exposure estimates. Where EPA was less confident in the use of available data to generate distribution curves, EPA characterizes the risk by indicating the proportion of empirical residues that exceed colony level endpoints. Where appropriate, EPA also uses site-specific residue information to characterize our confidence in the risk conclusions.

3) The registrant notes different effects endpoints (and/or 95% confidence intervals) from several Tier I studies with *Bombus terrestris*.

EFED Response: As the registrants note, EPA regularly verifies the statistical analysis in studies considered for quantitative use in the risk assessment. The verification of the statistical analysis for MRID 49570701, (acute oral and contact study with bumble bees) resulted in 96-hr acute oral and acute contact endpoints (with 95% confidence intervals in parenthesis) of 0.001943 (0.001596-0.002242) and 0.00199 µg a.i./bee (0.00166-0.00228), respectively. These endpoints are not considerably different from the endpoint values cited by the registrants.

4) The registrants note the lack of importance attributed to Tier III field study data in the preliminary bee risk assessments. Specifically, the registrant notes the availability of a number of field studies conducted in Canada (MRIDs 46907801, 46907802, 49248301) with clothianidin-treated canola seeds and finding no significant differences between treated and control sites. The registrant maintains that these field studies show that there are no significant treatment related effects resulting from the use of clothianidin as a seed treatment in canola and corn. The registrants also suggest that similar conclusions could also be reached for foliar or soil applied treatments for a variety of crops including canola and corn. Finally, the registrants note that Tier III studies are also helpful to address uncertainties regarding non-traditional routes of exposure such as through guttation fluid and abraded seed coat dust-off from treated seeds.

EFED Response: The preliminary bee risk assessment for clothianidin and thiamethoxam concluded that risk for bees foraging on treated corn and canola fields were considered low following treated seed applications. This was primarily based on the risk assessment approach at the Tier I and particularly the Tier II level, which showed that empirical residues were below colony level endpoints. The cited Tier III data contain a number of study deficiencies, as described in the registrants' comments and in EPA's data evaluation records. Data from these Tier III studies do not change the previous low risk conclusions for corn or canola, but do provide additional support to the overall conclusion of low on-field risk posed by these seed treatment

uses. The Tier III studies were generally considered more reliable for the information they provided on residues than for the toxicological effects data. However, the low levels of residues generally detected in the Tier III data following clothianidin seed treatments are consistent with other residue data and were below honey bee colony level endpoints.

EPA does not find that the cited Tier III data provide sufficient support that similar conclusions can generally be reached following foliar or soil-application of clothianidin, but that the residue data provided in these Tier III studies does support the lack of colony-level effects from foliar and/or soil applications in some cases (*e.g.* soil applications to corn). EFED does not generally find that the cited Tier III data are of sufficient utility to substantially inform potential risks posed by non-traditional routes of exposure. See the neonic common response to comments document for additional responses to public comments regarding assessing risks from non-traditional routes of exposure (DP 447635).

5) Registrants note errors and/or lack of units provided in tables on the tier I screening and refined analyses and suggest that the spray drift distances be characterized as worst-case situations

EFED Response: EPA appreciates the suggested corrections which have been considered in the final risk assessment and incorporated where appropriate. EPA also appreciates the characterization of the Tier I spray drift assessment as a worst-case exposure situation.

6) Registrants note the use of a qualitative NOEC for larval honey bees (20 µg c.e. {clothianidin equivalents}/g-diet; from MRID 48448803) in one table as opposed to the quantitative NOEC of 680 ng c.e./g-diet from MRID 48876801. Registrants also note that the qualitative NOEC should be 40 ng c.e./g-diet, rather than 20 ng c.e./g-diet.

EFED Response: EPA agrees that the quantitative NOEC should be used for the Tier I risk estimation, while the qualitative NOEC should have only been considered for risk characterization. EPA's review of the qualitative study (MRID 48448803) determined that overall chronic Day 22 endpoints could not be reliably determined, but that on an acute basis, the larval mortality NOAEC and LOAEC would be 40 µg c.e./kg-diet and >40 µg c.e./kg-diet, respectively. EPA also notes that in the process of conducting the final bee risk assessment, the NOEC and LOEC for MRID 48876801 were updated to 330 and 680 ng c.e./g-diet, respectively. The associated DERs for both of these chronic larval studies are available upon request.

7) For the Tier II analysis and conclusions for foliar applications to cucurbits, the registrants note that available information from studies investigating soil applications of clothianidin to several cucurbit crops suggest that pumpkin may not necessarily be a protective surrogate for residues in pollen and nectar of other cucurbit species. However, the registrants note that by using the pumpkin residue data there is a good margin of safety and that consideration of the other available cucurbit residue data is sufficient to address the variation found between cucurbit crops. The registrants also note that for soil applications to cucurbits, only a single residue value for cucumber exceeded the colony level endpoints, demonstrating the problem of using individual residue data points.

EFED Response: Thank you for your comment and agreement that pumpkin may not necessarily be a protective surrogate. In the final bee risk assessment, EPA considers all the residue data for cucurbits, including available data on other cucurbit crops and for other neonicotinoid active ingredients. This approach is detailed in **Attachment 2** of the final bee risk assessment and for

foliar applications to cucurbits, includes distributional modeling of neonicotinoid residues and decline rates in cucurbit crops, considering median and upper bound protective residue values.

8) For the Tier II Analysis for foliar applications to oilseed crops (cotton only), the registrants note that the risk assessment used data for a study (MRID 49733302) conducted at a higher application rate (0.1 lb a.i./A), than is currently registered (maximum currently registered application rate of 0.083 lb a.i./A). Therefore, the risk assessment should preferentially use the other cotton study (MRID 49904901), which was conducted at the lower rate in the risk assessment. For the oilseed crops seed treatment analysis (cotton and canola), the registrants note the lower than maximum application rate and limited information to encompass geographical variation from the available canola study, but the registrant also notes the large margin of safety that is sufficient to address these uncertainties, in addition to the decreased exposure in canola of only three weeks, compared to the six-week exposure period associated with the colony feeding study.

EFED Response: Thank you for your comment. As noted above, EFED generally used the maximum application rates identified in the Label Data Report spreadsheet, provided by BEAD in April 2016. Label changes that were made subsequent to that report may not always be reflected in the final bee risk assessment. In the case of foliar applications of clothianidin to cotton, the residue bridging strategy (**Attachment 2**) indicated that residues in the final bee risk assessment should be normalized to total application rate. As the total application rate (0.2 lb a.i./A) remains unchanged between earlier and current labels, the change in the single maximum labeled application rate from 0.1 lb a.i./A to 0.083 lb a.i./A does not alter either the Tier II risk analysis or any risk conclusions. EFED also notes that the final bee risk assessment considered all available data for foliar applications of clothianidin to cotton, including both MRIDs 49904901 and 49733302.

In regard to the comments on seed treatment applications to cotton and canola, the conclusions from the final bee risk assessment arrive at similar conclusions in that the large difference (approximately an order of magnitude) between the measured residues and the colony level endpoints are sufficient to address the uncertainties regarding geographic variation and lower application rates. EFED also agrees that the six-week exposure represented in the colony feeding study is a reasonably conservative scenario for evaluating potential effects for colonies exposed to residues in canola fields for up to three weeks. However, currently available data are not sufficient to suggest what is the shortest specific length of time of exposure necessary to elicit the sustained effects observed in the colony feeding study.

9) For the Tier II analysis and conclusions for soil applications to citrus, the registrants note that a second application in citrus would normally occur only if adequate pest insect control was not maintained, suggesting that residue levels had declined. The registrants also comment that even if citrus were to bloom longer than six weeks, the CFS study involved the bees feeding predominantly on treated nectar (sucrose) over a 6-week exposure period and is thus very much worst case, especially when considering the area over which bees feed and the dilution of exposure due to their need for a variety of forage types.

EFED Response: The Section 18 emergency exemption labels for soil applications to citrus note that second applications of clothianidin are allowed in a season with either a 6 week retreatment interval (for the 0.1 lb a.i./A rate allowed on trees up to five feet tall) or a 4 month interval (for the 0.2 lb a.i./A rate allowed for trees up to 9 feet tall). No language is present on

the Section 18 label to suggest that second applications only occur if adequate pest insect control is not maintained and further such language would be advisory only. Additionally, EFED notes that adequate pest control may not be maintained either through residues declining (as the registrant notes) or through developed resistance in the pest population (in which case residues may not have declined as thoroughly as the registrants suggest). The final bee risk assessment for soil applications to citrus primarily evaluate the impact of the 0.2 lb a.i./A rate and additionally characterize the potential risk by noting that under the scenario of a second application, residues and consequent risk may be higher. Regarding the registrants' comment on potential dilution of exposure due to a variety of forage types, the assessment considers both nectar and pollen exposures and notes that even with an approximately 2x reduction in residues due to dilution from other, uncontaminated, sources of forage, the colony level NOAEC would be exceeded.

10) The registrants comment on the lack of reliability and/or various other deficiencies of various acute and chronic Tier I studies including Thompson *et al.* (2014; suggesting lack of any synergistic effects), Bailey *et al* (2005), Laurino *et al.* (2011), Sandrock *et al.* (2013), and Abbott *et al.* (2008).

EFED Response: EFED agrees with the registrants and considered all of these data qualitatively in the preliminary bee risk assessment due to a variety of issues, including those noted by the registrants. EFED also noted in the preliminary risk assessment that the Thompson *et al.* (2014) study did not suggest greater-than-additive (GTA) toxicity for three of the four fungicides tested in combination with clothianidin. The LD_{50} for clothianidin in combination with tebuconazole was however significantly more sensitive than for clothianidin-alone. Sufficient information was not available from the study report for EFED to determine whether GTA effects might be present across a range of doses.

11) The registrants commented on differences between their submitted colony feeding study and other colony studies such as Sandrock *et al* (2014b) and Williams *et al* (2015) and mentioned several weaknesses of these open literature studies.

EFED Response: EFED agrees with the registrants that these open literature studies had several notable issues including lack of multiple treatment doses. EFED considered these studies qualitatively since they are useful for considering potential impacts from exposures to contaminated pollen that were not evaluated in the registrant's CFS study that focused on nectar exposures. Subsequent to the preliminary bee risk assessment, the registrant submitted a pilot pollen feeding study (MRID 50478501) with multiple doses of exposed pollen patties and including a reasonable degree of replication (n=8), long-term exposure (six weeks), continued observations of colony level endpoints at multiple post-exposure assessments, and raw data to verify statistical conclusions. EFED considered that this study (MRID 50478501) could be used quantitatively in the final bee risk assessment and that it addressed many of the uncertainties of the cited open literature. As such, more emphasis was placed on the results of this study in the final bee risk assessment (including in development of the pollen methodology described in **Attachment 1** of the risk assessment) than is placed on the more qualitative studies considered from the open literature.

12) In Appendix II of the registrant's comments, they note several additional registrant field studies conducted in France for soil in-furrow applications of clothianidin (Santana) to maize seeds (Thompson 2011), and post-bloom foliar application of clothianidin (Dantop 50WG) to apple

(Thompson 2012a) and apple and peach (Thompson 2012b) orchards that could inform the risk assessment. The orchard study data includes information on clothianidin residues in flowering weeds present on the field including palynological analysis.

EFED Response: These studies do not appear to have been submitted to the Agency, and EFED encourages the registrant to submit them. The reported results presented in their comments were not considered in the final bee risk assessment, since the Agency did not have these studies available. Given that residue data have already been submitted for soil in-furrow applications of clothianidin to maize in the U.S. across a range of corn-producing areas (MRIDs 49372102, 50009301, 50154301) and for post-bloom application to orchard crops including peach and apple in the U.S. (MRIDs 50154303, 50154304) and based on the registrants reported results, it seems unlikely that submission and review of this earlier data would change the risk conclusions for either in-furrow soil applications to corn or post-bloom foliar applications to orchard crops. However, it may provide additional information for further characterization in any future clothianidin risk assessments.

Beyond Pesticides; EPA-HQ-OPP-2011-0865-0204

Most comments from this commentator are relevant to all the neonicotinoids and are addressed in the document: EFED Response to Public Comments Common to the Preliminary Pollinator and Preliminary Non-Pollinator Registration Review Risk Assessments Across the Four Neonicotinoid Pesticides (Imidacloprid, Thiamethoxam, Clothianidin, and Dinotefuran). The following comment was determined to be clothianidin-specific

1) The commentator notes that clothianidin, specifically, may have impacts on immune system function in honey bees. The commentator notes several studies addressing potential clothianidin impacts to non-apical endpoints surrounding immune system function as well as one (Lopez *et al.* 2017) that observed greater-than-additive higher larval mortality in honey bee colonies when clothianidin was present in combination with bacterial infection than for either infection-alone or clothianidin-alone.

   EFED Response: Most of the commenter's discussion centers on effects to sub-lethal endpoints such as hemocyte counts, antimicrobial activity, and protein activation and signaling. Risk estimation for regulatory risk assessment generally relies on data from mortality, growth, and reproductive endpoints (apical endpoints). Consequently, risks are quantitatively evaluated using these apical endpoints, and additional effects seen in other types of studies are considered in risk characterization on a case-by-case basis if appropriate.

   Regarding the cited study (Lopez *et al.* 2017) that examined potential combined effects of clothianidin and American Foul Brood (AFB) inoculation on the apical endpoint of larval/pupal mortality in individual bees (*not whole colonies as the commenter suggests*), this study was not available at the time of the preliminary bee risk assessment and therefore could not be considered in that risk assessment. Upon a cursory review of the study, it appears to suggest the potential for mortality from combined clothianidin and AFB exposure exceeding the additive mortality suggested by either clothianidin-alone or AFB-alone exposures. However, the study only used a single concentration of clothianidin so no dose-response relationship can be ascertained from the study, decreasing confidence in its stated conclusions. Also, the single dose tested (total dose of 32 ng clothianidin/bee, equivalent to ~8 ng clothianidin/bee/day) is higher than the 21-day endpoint (NOAEC of 3.7 ng clothianidin equivalents/bee/day, LOAEC of

6.6 ng c.e./bee/day; MRID 50096607) that EPA used in the final bee risk assessment. Therefore, a cursory review of this study suggests that its utility is limited, that the quantitative endpoints EPA used to assess chronic risks to larval bees are protective, and that this study therefore would not impact the risk assessment conclusions.

USA Rice; EPA-HQ-OPP-2011-0865-0218, California Rice Commission, EPA-HQ-OPP-2011-0865-0235

1) The commenters noted that rice is not attractive to any bee species. Additionally, USA Rice cited two studies in their appendices that suggest maximum neonicotinoid residues in rice pollen to be either very low (Lorenz *et al*. 2017; maximum mean concentration of 2.2 ppb following rice seed treatment with Cruiser Maxx) or undetected (Gore *et al*. 2017; all treatments; Lorenz *et al*. 2017;

EFED Response: In assessing whether on-field risks to bees occur, EPA uses established USDA guidance on the attractiveness of agricultural crops to pollinating bees. This document notes that rice (*Oryza sp.*; not including wild rice) is not attractive to honey bees, bumble bees or solitary bees. As such, the final bee risk assessments conclude that on-field risks to bees are not expected from the use of clothianidin seed treatments on rice. EPA appreciates the information the commenter cites from the two unpublished literature studies (Lorenz *et al*. 2017, Gore *et al. 2017*) that suggest that even if bees were to consume rice pollen, residues in pollen would be expected to be very low following either seed treatments of applications.

Section 2. EFED Response to Comments for Clothianidin-Specific Preliminary Non-Pollinator Risk Assessment Public Comments

This section responds to clothianidin-specific public comments that were received on the *"Preliminary Aquatic and Non-Pollinator Terrestrial Risk Assessment to Support the Registration Review of Clothianidin"* (DP 439290; 11/27/2017; Docket ID: EPA-HQ-OPP-2011-0865-024).

Bayer Crop Science and Valent USA; EPA-HQ-OPP-2011-0865-0962

1) The study that the EPA is using as the primary source for the freshwater aquatic invertebrate chronic assessment, Cavallaro 2017, is not consistent with other studies of the same type for the emergence endpoint. When the EPA prepares the final risk assessment, the use of Cavallaro 2017 results should be revisited. The reliability of this study should be re-evaluated with respect to consistency with other studies, including those originating from the same lab. As the endpoint chosen for this assessment becomes an EPA Aquatic Life Benchmark, this evaluation has implications beyond the decision-making within a FIFRA context. Considering the importance of clothianidin to US agriculture, it is imperative that the EPA use reliable, sound science in their ecological risk assessments.

   EFED Response: EPA's data evaluation record (DER) for Cavallaro *et al*, 2017 will be available in clothianidin's registration review docket. The DER does note some uncertainties in the study including that exposures were quantified in the overlaying water and not the pore water, and that mean measured concentrations were below nominal concentrations by up to 50%, while the overall variability appeared to be low. However, these uncertainties were not considered sufficient to reduce the classification of the study to qualitative. EFED notes that the study results for adult emergence of *C. dilutus* (which was the most sensitive chronic endpoint of 0.05 µg a.i./L used in the risk assessment) showed a reasonably good dose-response, although both the 0.05 and 0.2 µg a.i./L treatment groups exhibited identical 42% inhibitions in emergence, relative to controls.

   EFED also notes that for the comparative evaluation of risks from neonicotinoids to aquatic invertebrates, the Raby *et al.*, 2018b study (also conducted on *C. dilutus*) identified a NOAEC of 0.31 µg a.i./L for clothianidin, based on 41% inhibition on adult emergence at 0.63 µg a.i./L, relative to controls, which is relatively similar to the effects observed in Cavallaro *et al.*, 2017. Further, the Raby *et al.*, 2018b study found that the most sensitive endpoint for clothianidin was for average adult lifespan with a NOAEC of 0.16 µg a.i./L, based on a 21% effect at the 0.31 µg a.i./L, relative to controls (DP 455690). Finally, EFED notes that chronic risk conclusions for aquatic invertebrates are unlikely to change whether the chronic endpoint of <0.05 µg a.i./L from Cavallaro or the chronic endpoint of 0.16 µg a.i./L are used to evaluate the potential for chronic risks posed by the uses of clothianidin.

Bayer Crop Science and Valent USA; EPA-HQ-OPP-2011-0865-0963

2) EFED performed kinetic analysis for 10 soils in two aerobic soil metabolism studies (MRID 45422325, four soils; MRID 45422326, six soils) and derived a degradation half-life for each soil, ranging from 144 days to 5,357 days. Studies on three soils were conducted for approximately 1-year per the study guidelines available at the time the studies were conducted (1997-1998); 365 days for

"Hanhofen" loamy sand soil and "Indiana" sandy loam soil (MRID 45422325), 379 d for "Crosby" silt loam soil (MRID 45422326). However, current guidelines (OCSPP 835.4100) limit the aerobic soil metabolism study to 120 days, to avoid the decreased microbial activity that occurs in the artificial laboratory system. The microbial activity shows a decline of 29%, 47%, and 63% at the end of the study for the "Hanhofen", "Indiana", and "Crosby" soils, respectively. Only data from soils with appropriate biomass and conducted for 6 months or less should be considered. The "Fuguay" soil should not be considered in exposure assessment due to the extremely low biomass which doesn't represent soil conditions in real world environment. This would result in a 90th percentile upper confidence limit of the mean half-lives at 20°C of 711 days, not 2709 days.

EFED Response: While OCSPP 835.4100 indicates that studies should not normally exceed 120 days, the guideline also indicates the following:

> *Termination of the test is possible after 120 days, or when at least 90% of the test substance is transformed, but only if at least 5% CO_2 is formed. When necessary to characterize the decline of the test substance and the formation and decline of major transformation products, studies can be continued for longer periods (e.g., 6 or 12 months) (see paragraph (j)(9) of this guideline).*

For all of the soils tested in MRIDs 45422325 and 45422326, parent residues were above 50% at Day 120, so characterization of the decline of the test substance beyond 120 days should be considered. For the "Hanhofen" soil, CO_2 levels continued to increase from 4.6% to 11.2% from Days 120 to 365. For the "Indiana" soil, CO_2 levels continued to increase from 6.9% to 14.7% from Days 120 to 365. For the "Crosby" soil, CO_2 levels continued to increase from 8.1% to 16.9% from Days 120 to 379. In these three cases, while microbial mass may have decreased, microbial activity continued and so did degradation of the clothianidin. While the "Fuguay" soil did have low biomass, there was only one measurement at Day 181 using soil that contained clothianidin and the value (25 mg microbial carbon per kilogram of soil) was comparable to another soil (Sparta) conducted in the same study, which the commenter included in their analysis.

EFED conducted a sensitivity analysis on the modeled aquatic EECs to evaluate the impact of using an aerobic soil half-life of 711 days versus 2709 days. EECs were reduced by less than 1% and did not change the risk conclusions. EFED will consider re-evaluating the aerobic soil metabolism studies during the next registration action.

3) A more complete assessment of real-world surface water exposure indicates the EPA's exposure estimates used for risk characterization are overly conservative. Consideration of aspects of the monitoring data beyond the maximum concentrations is critical in evaluating chronic risks. Spatial and temporal trends are crucial tools in determining the scope of any risks, and the use of average concentrations is essential to determining potential chronic risks. Finally, a full understanding of the types of water bodies being evaluated is necessary to ensure the water is relevant to the assessment being performed. Caution must be used when referencing data from open-literature when there is no identification of the monitoring location. While the difference in the monitoring versus modeled concentrations is recognized in the EFED assessment, high concentrations from field puddles and rice paddies are described, and it is not made clear that these do not represent surface water concentrations from sources relevant to an aquatic invertebrate risk assessment.

EFED Response: In very few instances are monitoring sites sampled frequently enough to ensure that the peak concentration has been measured. As a result, EFED does not conduct quantitative comparisons of monitoring data to acute/chronic endpoints. It is also difficult to assess trends, since the measured concentrations represent snapshots in time which generally are further apart than the endpoint durations being considered (*e.g.*, 21 days). Additionally, the Screening Level and Usage Analysis conducted by BEAD indicates that greater than 99% of the clothianidin applied in the United States is via seed treatment of corn, such that the available monitoring data are probably only reflective of this labeled use and not a reflection of other labeled uses that were modeled. EFED agrees that the monitoring data should not be quantitatively compared to chronic endpoints as stated above. While EFED agrees that puddles and ditches may not be considered suitable habitats for aquatic invertebrates, the concentrations reported in these waterbodies may be indicative of upper bound estimates found in ephemeral creeks (ditch) or static/semi-static waterbodies, such as an oxbow or prairie pothole (puddle), receiving runoff from an adjacent treated field. It should also be noted that the concentrations in these waters could eventually be transported to a waterbody considered more suitable for aquatic invertebrates. Removal of these values from consideration should only be done after careful evaluation of the monitoring site's metadata and the reasoning the monitoring agency used for sampling the site.

4) The terrestrial risk assessment for birds and mammals is overly conservative including that it does not consider acute dietary toxicity data, uses overly conservative chronic endpoints with effects that do not align with other neonicotinoids, includes unattractive seeds (cotton and soybean) for which exposure is negligible and also does not include mitigation measures such as pelleting of seeds.

EFED Response: The methods used to evaluate terrestrial risk to birds and mammals are standard in EPA's risk assessments, including the use of the T-REX model and acknowledging the various conservative assumptions inherent in the model (*e.g.* 100% of diet is contaminated with upper bound residues). In the clothianidin risk assessment, EFED further characterized this risk by considering the percent of diet needed to exceed the level of concern (LOC). As noted in the risk assessment, not all crops were modeled individually, but in some cases were used as surrogates for other crops (*i.e.* the cotton seed treatment risk assessment was used to represent potential risks to all oilseed crops as well as other seeds of similar size and application rates). While soybean seeds may inhibition digestion in some species, avian and mammalian pests such as blackbirds, house mice, and voles are well-known phenomena in soybean fields. Therefore, EFED cannot conclude that exposure is negligible. The risk assessment did find that although there were exceedances, risk to birds and mammals posed by soybean seed treatments were lower than for the other evaluated crops. Seed pelleting and other mitigation measures may be considered in the Proposed Interim Decision (PID).

Regarding the comment on dietary based toxicity endpoints, EPA used this data in our risk quotient calculations in the risk assessment, as well as the dose-based data. EPA acknowledges that the avian chronic endpoint is based on small (3%) reductions in eggshell thickness. Historically, this is known to be a very tight statistical test (*i.e.* can detect very slight differences). Insufficient information has been presented by the commenter to conclude that this is not a biologically relevant or toxicological response (*i.e.* the three doses tested are insufficient to conclude lack of dose-response, given that the statistical inhibition only occurred at the highest dose). EPA does not agree that comparison of chronic avian endpoints across neonicotinoid compounds is necessarily appropriate since chronic effects on birds appear to be different. For

example, chronic effects on birds observed at similar or lower concentrations of thiamethoxam and imidacloprid resulted in impacts to body weights, egg production and egg hatchability. These effects were not apparent from the clothianidin dataset.

5) The safety of clothianidin uses to birds and wild mammals is supported by higher tier exposure and effects data, avian population responses in regions of high use, and over a decade of extensive use without a labeled use incident.

EFED Response: EFED appreciates receipt of this information, but notes that multiple factors likely influence avian population dynamics in North America and elsewhere, which renders such general associations with pesticide use difficult to establish. EFED further notes that numerous studies have associated declines in global insect populations to multiple factors including (but not limited to) habitat loss, pathogens, invasive species, climate change and synthetic pesticides use (for review, see Sanchez-Bayo and Wyckhuys, 2019). The absence of reported incidents should not be construed that there are none; however, only that none have been reported to the Agency. As noted in the risk assessment, EPA's changes in the registrant reporting requirements for incidents in 1998 may account for a reduced number of overall reported incidents. Registrants are now only required to submit detailed information on 'major' fish, wildlife, and plant incidents. Minor fish, wildlife, and plant incidents, as well as all other non-target incidents, are generally submitted in aggregated reports and are not included in EIIS. In addition, there have been changes in state monitoring efforts due to lack of resources.

Valent USA; EPA-HQ-OPP-2011-0865-0964

6) The EFED risk assessment associated with use of clothianidin as a seed treatment was previously assessed in 2012. Additional evidence demonstrated the low risk of birds to treated lettuce seeds in 2012 that EPA has used to support the registration of this use and should be considered for the current USEPA 2017 risk assessment. In addition seed treatment stewardship to prevent and minimize seed spills is currently being undertaken by National Corn Grower Associate, Croplife America, American Soybean Association, American Seed Trade Association, National Cotton Council or America, Agricultural Retailers Association and National Association of Wheat Growers. Efforts are currently being made to educate farmers to clean and cover up seed spills immediately and dispose of left over seeds properly. This will further minimize exposure to birds and mammals.

EFED Response: The 2012 risk assessment referred to in the comment above was specific to the use of clothianidin as a seed treatment on leafy vegetable seed (*i.e.* lettuce). That risk assessment did not conclude that there was low risk to birds, but did conclude that label language requiring pelleting of the seed treatment (up to 40x the size of non-pelletized seeds, for the highest per-seed treatment rates) would be likely to reduce the potential risks. Further, pelleting the seeds at this 40x rate is likely to make them less attractive to wildlife, particularly small passerine birds that would be unlikely to consume many such seeds. The use of similar large pelleting factors on seeds does not appear to be present on most labeled seed treatment uses outside of the label (EPA reg no. 59639-151) that was specifically assessed in the 2012 risk assessment and therefore was not considered for most of the uses in the 2017 risk assessment. EPA appreciates the seed treatment stewardship efforts described in the public comment that are intended to reduce seed spillage.

7) For rice applications, EFED failed to consider its 2012 assessment, where PFAM was used to estimate paddy water concentrations which were released into the standard EPA pond, which generated a peak concentration of 0.0004 µg/L. Additionally, EFED failed to consider results from aquatic field dissipation studies which showed paddy concentrations were below the limit of detection (1 µg/L) at 14 days.

EFED Response: Since 2012, EFED has developed a methodology for evaluating risks to aquatic invertebrates using PFAM[1]. While the model allows for the discharge of the paddy water into the standard EPA pond, EFED does not assess discharges into receiving waterbodies when using PFAM for modeling in its ecological risk assessments. EFED guidance indicates that "Risk to aquatic animals is assessed in the rice paddy with exposure estimated using PFAM. Risk to aquatic plants and aquatic animals is also characterized by assessing pesticide concentrations in tailwater after a specified holding period." This method of modeling accounts for species that may be exposed to EECs at the outfall of a rice paddy, prior to dilution in a waterbody.

An analysis of the PFAM results indicates the results closely match those observed in the aquatic field dissipation studies. The results from the aquatic field dissipation studies indicate a maximum concentration of 210 µg/L (Louisiana) decreasing to 3 µg/L at 14 days and 52 µg/L (California) decreasing to < 1 µg/L at 14 days in paddy water for foliar applications. For treated seed applications, concentrations decreased from 4.7 µg/L to 1.5 µg/L at 14 days (Louisiana). Modeling of foliar applications indicate a daily peak paddy water concentration of approximately 83 µg/L for applications made after flooding, with a decrease to 1-4 µg/L at 14 days after application for foliar treatments. For treated seed applications, maximum daily paddy water concentrations were approximately 3 µg/L and did not decrease over 14 days after flooding.

8) In certain instances, EFED used the incorrect application rates and re-treatment intervals (RTIs) in their assessment. The following table provides a summary of the rates and RTIs used in the assessment and what is provided on the label.

Crop	Assessment	Label
Brassica	RTI of 7 days	RTI of 10 days
Cucurbit vegetables	RTI of 7 days	RTI of 10 days
Tree nuts	One application of 0.2 lbs ai/A	2 applications of 0.1 lbs ai/A, RTI of 10 days
Cotton	Two applications of 0.102 lb ai/A	One application of 0.083 lb ai/A
Pome fruit	One application of 0.2 lb ai/A	2 applications of 0.1 lbs ai/A, RTI of 10 days
Non-agricultural uses	Turf – One application of 0.404 lb ai/A Ornamental– One application of 0.41 lb ai/A	One application of 0.4 lb ai/A

Bold indicates uses that were modeled in the assessment.

[1] OPP. 2016. Development of a Conceptual Model to Estimate Pesticide Concentrations for Human Health Drinking Water and Guidance on Conducting Ecological Risk Assessments for the Use of Pesticides on Rice. September 2016 (https://www.epa.gov/sites/production/files/2016-10/documents/pfam-whitepaper.pdf)

Additionally, it is unclear if the proper droplet size distribution (medium to coarse, as specified on the labels) was used, as there was no mention of this in the modeling.

EFED Response: The application rates EFED used in the risk assessment were based on BEAD's Label Data Report generated in 2014. A review of the 2016 labels indicates that the application rates used in the assessment were incorrect. While the cotton label indicates a single application rate of 0.083 lb ai/A, the label also indicates not to apply more than 0.2 lb ai/A/year.

EFED modeling for the 2017 non-pollinator risk assessment used spray drift fractions for fine to medium (aerial) or very fine to fine (ground) droplet spectra, instead of the medium to coarse (aerial) or fine to medium coarse (ground) spray drift fractions. As a result, the aquatic model was rerun as part of this response to comments document. The range of EEC reductions based on the new modeling is between 5 and 70%, with the high reductions being in drift-dominated modeling, where EECs were already around 1 µg/L. Correction of the droplet spectrum modeling does not change risk conclusions for chronic risks to freshwater aquatic invertebrates (NOAEC = 0.05 µg/L).

9) Use of the 90% upper confidence limit on the mean to generate model input parameters is inappropriate in conjunction with the NAFTA kinetics guidance. In order for the statistical tool to yield valid result a normal data set is required. However generation of representative half-lives in accordance with the NAFTA guidance yields a skewed data set (where a cumulative distribution of the data are not evenly distributed about the mean). Calculation of the 90% upper confidence limit on the mean of a skewed data set does not produce a meaningful result and is an incorrect use of the statistical tool.

EFED Response: EFED's practice is to consider all of the acceptable data and use the 90th percentile upper confidence bound on the mean to account for variability in the half-life values. While the sample dataset appears skewed, the underlying assumption is that these are randomly measured values from an underlying population of half-life values that are normally distributed. As a result, EFED believes the method accounts for variability in the dataset and provides a protective estimate of how the pesticide degrades.

10) According to the "Guidance for Residues of Concern in Ecological Risk Assessment" (2012b) TMG should not be included or assessed as a residue of concern. TMG is two orders of magnitude less toxic (15 µg a.i./L) than the parent compound most sensitive species *C. dilutus* (0.05 µg a.i./L). Additionally, based on the mechanism of action (Tomizawa and Casida), "The electronegative pharmacophore, crucial for optimum potency of the neonicotinoids, is proposed to associate with a cationic subsite (possibly lysine, arginine, or histidine) in the insect nAChR." This pharmacophore in clothianidin is the nitro moiety which is not present in TMG.

EFED Response: The toxicity study described by the commenter (MRID 49844002) was a non-definitive study, where the NOAEC could not be determined, because chronic effects were observed at the lowest tested dose (15 µg/L). This is similar to a previous chronic study (MRID 45422510) that also detected significant effects at the lowest tested dose of 18 µg/L. Acute data are also not available for characterizing the acute toxicity of TMG as a potential comparison to parent clothianidin. As a result, there is uncertainty in categorizing TMG as less toxic than parent clothianidin. Exclusion of the TMG residues in the surface water modeling results in a

reduction in concentrations of < 15% but does not change the ultimate risk conclusions about chronic risks to freshwater aquatic invertebrates (NOAEC = 0.05 µg/L).

Center for Biological Diversity (CBD); EPA-HQ-OPP-2011-0865-0949

Most comments from this commentator are relevant to all the neonicotinoids and are addressed in the document: EFED Response to Public Comments Common to the Preliminary Pollinator and Preliminary Non-Pollinator Registration Review Risk Assessments Across the Four Neonicotinoid Pesticides (Imidacloprid, Thiamethoxam, Clothianidin, and Dinotefuran). The following comment was determined to be clothianidin-specific

1) The commentator notes that the risk assessment ignored open literature studies with lower toxicity values (4.4, 2.83, 2.32, 2 and 1.85 µg a.i./L) than the registrant-submitted study used quantitatively in the risk assessment. The comment notes that each of these four studies are suitable for quantitative use.

   EFED Response: EPA determined that the four studies the commenter describes (Yokoyama *et al.*, 2009, de Perre *et al*, 2015, Stevens *et al.*, 2005, and Miles *et al*. 2017) were all of qualitative utility and therefore were not used to quantitatively estimate risk quotients in the risk assessment. Data Evaluation Records (DERs) for these studies, and for MRID 45422414, from which the quantitative acute aquatic invertebrate endpoint (used in the risk assessment) of 22 µg a.i./L was derived, are available for these studies upon request.

   EPA also notes that in a comparative analysis of neonicotinoid aquatic insect risk estimates (DP 455690), acute risk estimates were recalculated for all uses using quantitatively acceptable data from Raby *et al*, 2018 and that the most sensitive acute toxicity endpoint used for clothianidin was 3.54 µg a.i./L, which is close to the reported endpoints from the qualitative studies the commentator cited. The DERs for Raby *et al.*, 2018 are available in the public docket for the registration review of clothianidin. Finally, EPA notes that all these open literature data that the commenter cites, as well as the more recent Raby *et al*, 2018 study generally support the aquatic risk assessment conclusions from the preliminary non-pollinator risk assessment for clothianidin.

Section 3. Addendum to the Clothianidin Preliminary Non-Pollinator Risk Assessment

This section serves as an addendum to the clothianidin preliminary non-pollinator risk assessment, to correct modeling or risk quotient errors that were identified in public comments, or where additional characterization or impacts to risk conclusions are discussed.

Incorporation of the 2019 Seed Treatment Modeling Guidance into the Neonicotinoid Risk Assessments

In 2019, EFED finalized guidance for aquatic modeling of granular and treated seed applications, to standardize EFED's surface water modeling approach. The guidance recommends using the "linearly increasing with depth" option (a.k.a. the triangle method) in the Pesticide Water Calculator (PWC) model, to account for seeds or granules placed at depths shallower than the incorporation depth specified on the labels. Prior to the 2019 guidance, the assumption in the PWC model (*i.e.* the "at depth" option) was that residues from treated seeds or pesticide granules placed below 2 cm were not available for runoff. Huff Hartz et al[2] and Young and Fry[3] have demonstrated that when pesticide is incorporated below 2 cm, as is the case with some treated seeds, runoff of pesticide can still occur.

In the non-pollinator DRAs for the neonicotinoids, the "at depth" option was used for modeling treated seeds, resulting in estimated exposure concentrations (EECs) of 0 µg/L for seeds planted at depths greater than 2 cm. **Table 1** depicts the impact on the EECs for clothianidin using the triangle method compared to "at depth" option, as well as the range of the EECs for foliar and soil applications of clothianidin. The EECs with the new method range from 0.1 – 2.3 µg/L. For seed treatments that had EECs greater than 0 in the 2017 assessment, EECs increase by a factor of 2-30 times using the triangle method, with larger increases occurring with larger depths of incorporation. While EECs for seed treatments will increase, the revised EECs are still 4-100 times lower than maximum EECs generated for foliar and soil applications.

Monitoring data (**Figure 1**) has shown detections of clothianidin in surface water. Since over 99% of clothianidin usage is on treated corn seed, these detections support the updated modeling approach. **Figure 1** provides a comparison of clothianidin seed treatment modeling for corn using the triangle method, with the available monitoring data. The lower two blue lines reflect the corn seed treatment EECs. Given the modeling EECs reflect 1-in-10 year values, the EECs for corn seed treatment using the triangle method appear to fall in line with the upper bound monitoring values. For clothianidin, this is especially important because corn seed treatment use accounts for the predominant usage of clothianidin in terms of pounds applied.

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[2] Huff Hartz, K., Edwards, T., Lydy, M. 2017. Fate and transport of furrow-applied granular tefluthrin and seed-coated clothianidin insecticides: Comparison of field-scale observations and model estimates. Ecotoxicology (2017) 26:876–888

[3] Young, D., Fry, M. 2017. Field-scale evaluation of pesticide uptake into runoff using a mixing cell and a non-uniform uptake model. Environmental Modeling & Software 9/22/2017. https://doi.org/10.1016/j.envsoft.2017.09.007

Table [SEQ Table * ARABIC]. Comparison of Revised and Original EECs for Clothianidin

Scenario	Seeding Depth (cm)	2017 Assessment - at Depth					Current Approach - Triangle				
		Water Column EEC (ug/L)			Benthic EEC (ug/L)		Water Column EEC (ug/L)			Benthic EEC (ug/L)	
		1-d	21-d	60-d	Peak	21-d	1-d	21-d	60-d	Peak	21-d
MS cotton	1.27	0.87	0.79	0.61	0.31	0.31	2.14	1.87	1.51	0.76	0.76
CA cotton	1.27	0.08	0.07	0.05	0.02	0.02	0.25	0.21	0.16	0.08	0.08
MS corn	2.54	0	0	0	0	0	0.59	0.53	0.41	0.20	0.20
CA corn	2.54	0	0	0	0	0	0.10	0.09	0.07	0.03	0.03
MS soybean	1.91	0.07	0.06	0.05	0.02	0.02	1.77	1.53	1.17	0.57	0.57
CA corn	1.91	0.01	0.01	0.01	<0.01	<0.01	0.28	0.24	0.19	0.10	0.09
MN sugarbeet	1.27	0.68	0.6	0.47	0.24	0.23	1.50	1.30	1.02	0.52	0.52
CA sugarbeet	1.27	0.48	0.42	0.35	0.19	0.19	1.11	0.97	0.79	0.44	0.43
TX wheat	2.54	0	0	0	0	0	2.27	1.99	1.64	0.88	0.88
CA wheat	2.54	0	0	0	0	0	0.43	0.38	0.24	0.15	0.13
Foliar (all)							0.9-8.15	0.8-7.04	0.8-5.70	0.46-2.89	0.46-2.87
Soil (all)							0.7-11.4	0.61-9.87	0.47-7.41	0.24-3.37	0.24-3.34

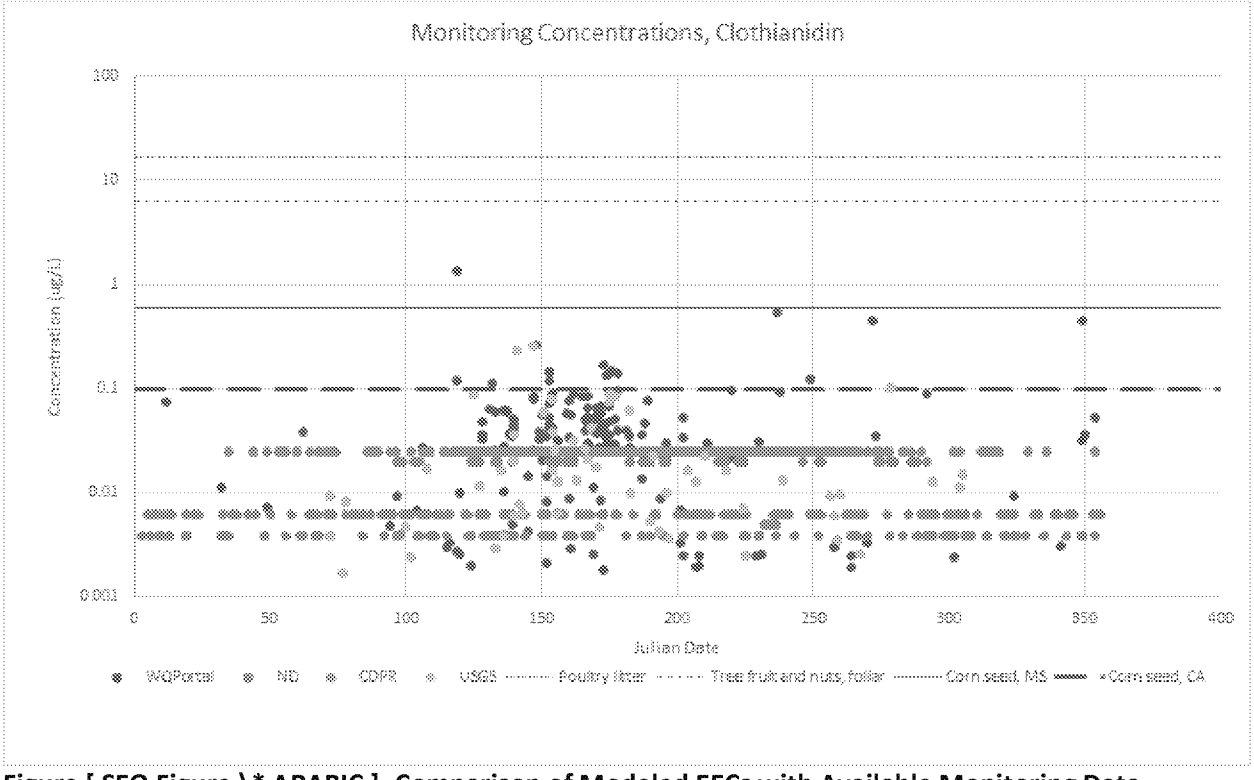

Figure [SEQ Figure * ARABIC]. Comparison of Modeled EECs with Available Monitoring Data

[PAGE * MERGEFORMAT]

In conclusion, incorporation of the new EFED approach for aquatic modeling of granular and treated seed applications is appropriate and will continue in future assessments of the neonicotinoids. In general, the revised methodology should better represent what happens in the field (*i.e.*, runoff of pesticide will occur, even when incorporated below 2 cm) and, while the EECs for incorporated products will change, overall these EECs are less than those for foliar and soil uses.

Revised Aquatic EECs

As discussed above on pages 14-15, incorrect application rates and spray drift fractions were used in the aquatic modeling conducted for the preliminary risk assessment for clothianidin. **Table 2** reflects the revised EECs for clothianidin uses and replaces **Table 2-13** in the preliminary risk assessment. Modeling for poultry litter applications did not change. Seed treatment EECs are discussed above in the previous section. As mentioned above, the risk conclusions did not change based on the revised modeling. These EECs were incorporated and integrated with new toxicity data (Raby *et al*, 2018) to derive new risk quotients (RQs) in the comparative analysis of neonicotinoid aquatic insect risk estimates (DP 455690).

Table 2. Revised Aquatic EECs for Clothianidin Total Toxic Residues

Use	PWC Scenarios	Water column concentration (µg/L)			Benthic concentration (µg/L)	
		1-d	21-day	60-day	Peak	21-day
Foliar Application						
Cotton	MS cotton	1.19	1.01	0.79	0.45	0.48
	CA cotton	0.55	0.50	0.38	0.17	0.17
Potato	FL potato	4.32	3.81	3.10	1.70	1.69
	ID potato	1.23	1.12	0.92	0.49	0.49
Cucurbits/fruiting vegetables/low growing berries/leafy vegetable	FL cucumber	6.10	5.73	5.47	2.61	2.59
	CA lettuce	3.40	2.92	2.25	1.21	1.20
Grape	NY grapes	1.33	1.18	1.05	0.93	0.89
	CA wine grapes	0.39	0.37	0.29	0.16	0.16
Tree fruit and nuts	OrchardBSS	4.14	3.54	2.69	1.20	1.19
	CA almonds	0.76	0.78	0.74	0.39	0.39
Ornamental	TN nursery	4.21	3.59	2.82	1.36	1.35
	CA nursery	0.87	0.75	0.57	0.36	0.35
Turf	FL turf	1.71	1.43	1.06	0.47	0.46
	CA turf	3.06	2.67	2.15	1.22	1.21
Forestry	OR Xmas tree	0.71	0.62	0.49	0.29	0.29
	NC apples	7.34	6.34	5.08	2.57	2.55
Soil Application						
Citrus (Sect 18 in FL only)	FL citrus	4.45	3.74	3.22	1.54	1.53
Potato	FL potato	4.82	4.25	3.36	1.79	1.77
	ID potato	0.36	0.33	0.28	0.14	0.14
Cucurbits/fruiting vegetables/low growing berries/leafy vegetable	FL cucumber	8.52	7.60	5.77	2.54	2.53
	CA lettuce	4.02	3.51	2.71	1.58	1.57
Grape	NY grapes	1.24	1.09	0.87	0.83	0.79
	CA wine grapes	0.20	0.17	0.13	0.07	0.07
Tree fruit and nuts	OrchardBSS	10.50	9.05	6.80	3.09	3.06
	CA almonds	1.31	1.18	0.93	0.44	0.43
Ornamental	TN nursery	3.97	3.45	2.63	1.28	1.27

Use	PWC Scenarios	Water column concentration (µg/L)			Benthic concentration (µg/L)	
		1-d	21-day	60-day	Peak	21-day
	CA nursery	0.70	0.60	0.46	0.24	0.24
Forestry	OR Xmas tree	2.39	2.14	1.50	0.85	0.85
	NC apples	4.46	3.85	2.94	1.43	1.42

Appendix 1. List of Neonicotinoid Pollinator and Non-pollinator Risk Assessments and Corresponding Docket ID Numbers

	Pollinator / Bee Risk Assessment	Non-pollinator Risk Assessment(s)
Imidacloprid	Preliminary Pollinator Assessment to Support the Registration Review of Imidacloprid. (DP 429937, 1/4/2016) Docket ID: EPA-HQ-OPP-2008-0844-0140 Final Bee Risk Assessment to Support the Registration Review of Imidacloprid. (DP 443668, 1/2020) Docket ID: EPA-HQ-OPP-2008-0844-xxxx	Preliminary Aquatic Risk Assessment to Support the Registration Review of Imidacloprid. (DP 435477, 12/22/2016) Docket ID: EPA-HQ-OPP-2008-0844-1086 Preliminary Terrestrial Risk Assessment to Support the Registration Review of Imidacloprid (DP 442830, 11/28/2017) Docket ID: EPA-HQ-OPP-2008-0844-1256
Clothianidin	Preliminary Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam. (DP 437097, 1/5/2017) Docket ID: EPA-HQ-OPP-2011-0865-0173 Final Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam. (DP 455645, 1/2020) Docket ID: EPA-HQ-OPP-2011-0865-xxxx	Preliminary Aquatic and Non-Pollinator Terrestrial Risk Assessment to Support the Registration Review of Clothianidin. (DP 439290, 11/27/2017) Docket ID: EPA-HQ-OPP-2011-0865-0242
Thiamethoxam	Preliminary Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam. (DP 437097, 1/5/2017) Docket ID: EPA-HQ-OPP-2011-0581-0034 Final Bee Risk Assessment to Support the Registration Review of Clothianidin and Thiamethoxam. (DP 455645, 1/2020) Docket ID: EPA-HQ-OPP-2011-0581-xxxx	Preliminary Aquatic and Non-Pollinator Terrestrial Risk Assessment to Support the Registration Review of Thiamethoxam. (DP 439307, 11/29/2017) Docket ID: EPA-HQ-OPP-2011-0581-0093
Dinotefuran	Draft Assessment of the Potential Effects of Dinotefuran on Bees (DP 437374, 1/3/2017) Docket ID: EPA-HQ-OPP-2011-0920-0014 Final Bee Risk Assessment to Support the Registration Review of Dinotefuran. (DP 451015, 1/2020) Docket ID: EPA-HQ-OPP-2011-0920-xxxx	Preliminary Ecological Risk Assessment (excluding terrestrial invertebrates) for the Registration Review of Dinotefuran. (DP 441527, 11/28/2017) Docket ID: EPA-HQ-OPP-2011-0920-0616